SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT IDENTIFIER: CHLORINE GAS
RECOMMENDED USAGE:
- Manufacturing of:
  - EDC (Ethylene Dichloride)
  - Synthetic Rubber
  - Chlorinated Hydrocarbons
  - Chlorinated Paraffin Wax (CPW), etc
- Water Purification
- Disinfectant for swimming pools
- Bleaching textiles
- Sanitation in industrial and municipal waters and sewage

MANUFACTURER: PT ASAHIMAS CHEMICAL
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SECTION 2 HAZARDS IDENTIFICATION

GHS Classification:

<table>
<thead>
<tr>
<th>Health</th>
<th>Environmental</th>
<th>Physical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Toxicity - Category 2</td>
<td>Aquatic Toxicity:</td>
<td></td>
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<tr>
<td>Eye Corrosion - Category 1A</td>
<td>• Acute 1</td>
<td>Oxidize.</td>
</tr>
<tr>
<td>Skin Corrosion - Category 1A</td>
<td>• Chronic 1</td>
<td>Hazardous gas under pressure.</td>
</tr>
<tr>
<td>Skin Sensitization - Category 1</td>
<td></td>
<td>May reach explosively with organic or combustible material - Category 1</td>
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<tr>
<td>Mutagenicity - Category 1A</td>
<td></td>
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<tr>
<td>Carcinogenicity - Category 1B</td>
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<tr>
<td>Reproductive/Developmental - Category 2</td>
<td></td>
<td></td>
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<tr>
<td>Target Organ Toxicity (Repeated) - Category 1</td>
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</tbody>
</table>

GHS Label:
Symbols: skull and crossbones, corrosion, health hazard

Hazard Statements
DANGER!
Poisonous, Corrosive gas under pressure.
Can cause eye, skin, and respiratory tract burns.
Can support combustion.
Can cause blindness, permanent scarring and death.
Toxic if swallowed and in contact with skin
Suspected of damaging the unborn child.
Suspected of causing genetic defects.

Precautionary Statements
Contact with combustible material may cause fire.
Do not get in eyes, on skin or clothing.
Do not breathe gas.
Do not puncture or incinerate container.
Store in tightly closed container.
Avoid contact with combustible materials.
Use only with adequate ventilation. Wash thoroughly after handling.
May cause damage to cardiovascular, respiratory, nervous, and gastrointestinal systems and liver and blood through prolonged or repeated exposure. Harmful to aquatic life. Contact with other material may cause fire.

Contact with rapidly expanding gases can cause frostbite.

### SECTION 3 COMPOSITION, INFORMATION ON INGREDIENTS

**CHEMICAL IDENTITY:** CHLORINE GAS  
**TRADE NAMES/SYNONYMS:**  
BERTHOLITE; CHLOOR (DUTCH); CHLOR (GERMAN); CHLORE (FRENCH); CHLORINE (DOT); CHLORINE MOL.; CLORO (ITALIAN); MOLECULAR CHLORINE  
**CAS NUMBER:** 7782-50-5  
**EC NUMBER (EINECS):** 231-959-5  
**EC INDEX NUMBER:** 7782-65-2  
**MINIMUM PERCENTAGE:** 99.98  
**NUMBER IN ANNEX 1 OF DIR 67/548:** Material is listed in annex 1. 017-001-00-7

### SECTION 4 FIRST AID MEASURES

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. No action shall be taken involving any personal risk or without suitable training. If fumes are still suspected to be present, the rescuer should wear an appropriate mask or a self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

**INHALATION:** Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

**SKIN CONTACT:** Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Discard contaminated clothing in a manner which limits further exposure. Remove contaminated clothing and shoes.

**EYES CONTACT:** (persons with potential exposure should not wear contact lenses), Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately. Do NOT allow victim to rub eyes or keep eyes closed.

**INGESTION:** Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

**NOTE TO PHYSICIAN:** Treat symptomatically and supportively.

### SECTION 5 FIRE FIGHTING MEASURES

**General Information:** As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. **SUITABLE EXTINGUISHING MEDIA:** Use what is appropriate for surrounding fire. **HAZARDOUS COMBUSTION PRODUCTS:** None. **UNUSUAL FIRE AND EXPLOSION HAZARDS:** Cylinder rupture may occur under fire conditions. Can react to cause fire and explosion when in contact with reducing agents. Flammable gases and vapors can form explosive mixtures with chlorine. Chlorine supports combustion. **SPECIAL FIRE FIGHTING INSTRUCTION AND EQUIPMENT:** Wear self-contained breathing apparatus and...
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CHLORINE GAS

full protective clothing. Keep fire exposed cylinders cool with water spray. If possible, stop the product flow.

SECTION 6 ACCIDENTAL RELEASE MEASURES

- PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT & EMERGENCY PROCEDURES:
  SPECIALIZED EQUIPMENT: None
  Use proper personal protective equipment as indicated in Section 8

- ENVIRONMENT PRECAUTION:
  Avoid dispersal of spilled material and runoff and contact with soil, waterways, drain and sewer.

- METHODS & MATERIALS FOR CONTAINMENT & CLEANING UP
  Evacuate and ventilate area. Remove leaking cylinder to exhaust hood or safe outdoor area. Position to release gas not liquid.

SECTION 7 HANDLING AND STORAGE

- PRECAUTIONS FOR SAFE HANDLING:
  Secure cylinder when using to protect from falling. Do not get in eyes, on skin or on clothing. Keep container closed. Use only with adequate ventilation. Store in tightly closed container. Avoid contact with combustible materials. Do not puncture or incinerate container. Wash thoroughly after handling. High pressure gas. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

- PRECAUTIONS FOR SAFE STORAGE (including any incompatibilities):
  Keep container tightly closed. Keep container in a cool, well-ventilated area. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over when not in use. Cylinder temperatures should not exceed 52 °C (125 °F).

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

- CONTROL PARAMETERS:
  OCCUPATIONAL EXPOSURE LIMIT or BIOLOGICAL LIMIT VALUE:
  EXPOSURE LIMITS:
    ACGIH TLV (United States, 1/2007).
    STEL: 1 ppm 15 minute(s).
    TWA: 0.5 ppm 8 hour(s).
    NIOSH REL (United States, 12/2001).
    CEIL: 0.5 ppm 15 minute(s).
    OSHA PEL (United States, 11/2006).
    CEIL: 1 ppm
    ACGIH TLV (United States, 1/2007).
    STEL: 2.9 mg/m3 15 minute(s).
    TWA: 1.5 mg/m 3 8 hour(s).
    NIOSH REL (United States, 12/2001).
    CEIL: 1.45 mg/m3 15 minute(s).
    OSHA PEL (United States, 11/2006).
    CEIL: 3 mg/m3

- APPROPRIATE ENGINEERING CONTROLS:
  Use only with adequate ventilation. If user operations generate dust, fumes, vapor or mist, use process
enclosures, local exhaust ventilation, or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits

PERSONAL PROTECTIVE EQUIPMENT

**Eyes:** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA’s eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin:** Wear appropriate protective gloves to prevent skin exposure. Impervious gloves, coveralls, boots, and/or other resistant protective clothing.

**Respirators:** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**HANDS:** Chemical-resistant, impervious gloves or gauntlets complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

**PERSONAL PROTECTION IN CASE:** Full chemical resistant suit and self-contained breathing apparatus only by trained and of a large spill authorized persons.

**OTHER PROTECTIVE EQUIPMENT:** Safety shoes when handling cylinders.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

**APPEARANCE**
- **PHYSICAL STATE:** LIQUID
- **COLOR:** Greenish – Yellow Gas/ Clear, amber liquid
- **CHANGE IN APPEARANCE:** Liquefied gas

**ODOR:** Suffocating pungent odor.

**ODOR THRESHOLD:** 0.08-0.4 ppm

**MOLECULAR FORMULA:** Cl₂

**MOLECULAR WEIGHT:** 70.9 g/mole

**PH:** 14 (5% solution)

**MELTING POINT:** -101.1°C (-150°F)

**BOILING POINT:** -33.9°C (-29°F)

**FLASH POINT:** Nonflammable

**CRITICAL TEMPERATURE:** 143.9°C (291°F)

**EVAPORATION RATE:** Gas

**FLAMMABLE LIMITS:** Nonflammable

**VAPOR PRESSURE:** 6.3 atm at 20°C (85.3 psig)

**VAPOR DENSITY (Air = 1):** 2.473

**SPECIFIC GRAVITY (water=1):** Gas 1.41 @ 20°C

**WATER SOLUBILITY:** (cm³/cm³ H₂O): 4.61 (1.46% @ 0°C) ; 8620 mg/L

**INSOLUBLE:**

**PARTITION COEFFICIENT n-octanol / water:** Not available

**AUTO-IGNITION TEMPERATURE:** Not available
DECOMPOSITION TEMPERTURE: Not available

SECTION 10 STABILITY AND REACTIVITY

- CHEMICAL STABILITY: Stable under normal storage conditions.
- CONDITIONS TO AVOID: Storage in poorly ventilated areas. Storage near a heat source.
- INCOMPATIBILITIES WITH OTHER MATERIALS: Chlorine reacts with reducing agents and combustibles. Materials such as acetylene, turpentine, hydrocarbons, ammonia, hydrogen, ether, powdered metals, etc. must be kept away.
- HAZARDOUS DECOMPOSITION: Chlorine will react with steam and water to give HCl fumes. Material combines with CO and CO2 to form phosgene and sulphuryl chloride.
- HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

LETHAL CONCENTRATION (LC50): 293 ppm, rat 1 hour ; 137 ppm, Mouse 1 hour
LETHAL DOSE 50 (LD50): N/A p   IDLH : 10 ppm

EFFECTS OF OVEREXPOSURE: The hazard at different concentrations is reported to be as follows:
- 0.2-0.5 ppm = No toxic, long term effect
- 1-3 ppm = Definite odor: irritation of eyes and nose
- 5-8 ppm = Throat, eye, and mucous membrane irritation
- 30 ppm = Intense coughing fits
- 34-51 ppm = Lethal in 1 to 1.5 hours exposure
- 40-60 ppm = Exposure for 30-60 minutes without effective respiration may cause bronchitis, pulmonary edema or bronchopneumonia
- 100 ppm = May be lethal after 50 minutes of exposure (estimated)
- 430 ppm = Lowest concentration known to cause lethality after 30 minutes of exposure
- 1000 ppm = May be fatal with a few deep breaths

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. May cause damage to the following organs: lungs, upper respiratory tract, skin, eye, lens or cornea.
CARCINOGENICITY (US ONLY):
- NTP – No
- IARC MONOGRAPHS – No
- OSHA REGULATED – No

MUTAGENICITY: (Microorganism, chromosomal aberration): Human being (lymphocyte): 20 ppm
Other toxic effects on humans:
- Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation (lung irritant).

REPRODUCTION TOXICITY: Two studies have been conducted to assess the ability of chlorine to cause reproductive effects. Rabbits exposed by inhalation to concentrations up to 1.5 ppm and rats exposed by ingestion to highly chlorinated drinking water daily for seven generations did not display any adverse reproductive effects. NSF Standard 60 Maximum Use 30 mg/L

TARGET ORGANS: Respiratory system, eyes, skin.

ACUTE EFFECTS: Chlorine gas can cause severe irritation of the eyes and respiratory system. May cause tearing, runny nose, sneezing, coughing, choking and chest pain. Can also cause pneumonitis and pulmonary edema. In high concentrations, it may irritate the skin and eyes and cause burning, prickling, inflammation and blistering.
POTENTIAL HEALTH EFFECTS

INHALATION: Harmful if inhaled. May causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, chest pain, vomiting, headache, anxiety, feeling of suffocation and possible coma. May cause pulmonary edema and severe respiratory disturbances. Repeated exposure to chlorine may result in reduced pulmonary capacity and dental erosion.

INGESTION: May cause circulatory system failure. Causes severe digestive tract burns with abdominal pain, vomiting, and possible death. May cause corrosion and permanent tissue destruction of the esophagus and digestive tract.

SKIN CONTACT: Causes skin burns. May cause photosensitive skin reactions in certain individuals.

EYE CONTACT: Causes eye burns. May cause irreversible eye injury. May cause painful sensitization to light. May cause conjunctivitis.

CHRONIC: Prolonged or repeated skin contact may cause dermatitis. Repeated exposure may cause erosion of teeth. Diseases of the Lung, and may predispose the individual to lung infections, including Tuberculosis.

SECTION 12 ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE: (9exposure)
- Fish toxicity (mortality) 96 hrs LC50 (Etheostoma spectabile – Orange darter): 390 ug/L;
- Invertebrate toxicity (mortality) 1 hr LC50 (Crassostrea gigas – Pacific oyster): 637.5 ug/L;
- Algal toxicity (population) 23 hrs (Algae – Phytoplankton, algal mat): 50 – 1000 ug/L;
- Phytotoxicity (growth) 96 days (Myriophyllum spicatum – Water-milfoil): 20 ug/L.

TOXICITY OF THE PRODUCTS OF BIODEGRADATION: The products of degradation are less toxic than the product itself.

ENVIRONMENTAL HAZARDS: Very toxic to aquatic organisms. Chlorine is designated as a marine pollutant by DOT. The LC50 in the fathead minnow has been cited as 0.1 mg/l/96 H and an LC50 of 0.097 mg/L/30 min has been cited for the Daphnia magna.

TOXICITY TO THE ENVIRONMENT: May cause changes in aqueous ecological systems. Vegetation contacted with chlorine or exposed to significant vapour concentration may suffer leaf scorching.

SECTION 13 DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD: Dispose of non-refillable cylinders in accordance with federal, state and local regulations. Chlorine gas will disperse to the atmosphere leaving no residue. When possible, move leaking container to an isolated area, allow gas to vent slowly to atmosphere in an unconfined area or exhaust hood. Position to release gas, not liquid. Ne volume of liquid chlorine is equivalent to about 460 volume of gas. Absorb in alkaline solution of caustic soda, soda ash, or hydrated lime. Liquid or solid residue must be disposed of in a permitted waste management facility.

If the cylinders are the refillable type, return cylinders to supplier with any valve outlet plugs or caps secured and valve protection caps in place.

SECTION 14 TRANSPORT INFORMATION

DOT CLASSIFICATION (US ONLY):
- PROPER SHIPPING NAME: Chlorine. Marine pollutant (chlorine)
- HAZARD CLASS: 2.3 (poison), Hazard Zone B
MATERIAL SAFETY DATA SHEET

CHLORINE GAS

IDENTIFICATION NUMBER: UN1017
PACKING GROUP: Not applicable (gas)
LABELING: POISON GAS, CORROSIVE
MARINE POLLUTANT MARINE POLLUTANT (P)
REPORTABLE QUANTITY10 LBS. (4.536 KG)
LIMITED QUANTITY: YES.
PACKAGING INSTRUCTION
PASSENGER AIRCRAFT QUANTITY LIMITATION: FORBIDDEN.
CARGO AIRCRAFT
QUANTITY LIMITATION: FORBIDDEN.
SPECIAL PROVISIONS: 2, B9, B14, T50, TP19

ADR / RID (EU Only): Class 2, 2TC

TDG CLASSIFICATION
PROPER SHIPPING NAME: Chlorine. Marine pollutant (chlorine)
HAZARD CLASS: 2.3 (poison), Hazard Zone B
IDENTIFICATION NUMBER: UN1017
PACKING GROUP: Not applicable (gas)
LABELING: POISON GAS, CORROSIVE
MARINE POLLUTANT MARINE POLLUTANT (P)
EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX : 0
ERAP INDEX : 500
PASSENGER CARRYING SHIP INDEX : FORBIDDEN
PASSENGER CARRYING ROAD OR RAIL INDEX : FORBIDDEN

MEXICO CLASSIFICATION
PROPER SHIPPING NAME: Chlorine. Marine pollutant (chlorine)
HAZARD CLASS: 2.3 (poison), Hazard Zone B
IDENTIFICATION NUMBER: UN1017
PACKING GROUP: Not applicable (gas)
LABELING: POISON GAS, CORROSIVE

SPECIAL PRECAUTIONS: Cylinders should be transported in a secure upright position in a well ventilated truck. The transportation of compressed gas cylinder in automobiles or in closed-body vehicles can present serious safety hazards and should be discouraged.

SECTION 15 REGULATORY INFORMATION


U.S. Federal regulations:
TSCA 8(a) CAIR: chlorine
TSCA 8(b) inventory: chlorine
SARA 302/304/311/312 extremely hazardous substances: chlorine
SARA 302/304 emergency planning and notification: chlorine
SARA 302/304/311/312 hazardous chemicals: chlorine
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: chlorine:
Fire hazard, Sudden Release of Pressure, Immediate (Acute) Health Hazard

Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: chlorine
Clean air act (CAA) 112 accidental release prevention: chlorine
Clean air act (CAA) 112 regulated flammable substances: No products were found.
Clean air act (CAA) 112 regulated toxic substances: chlorine

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations:
Pennsylvania RTK: chlorine: (environmental hazard, generic environmental hazard)
Massachusetts RTK: chlorine
New Jersey: chlorine

WHMIS (Canada):
Class A: Compressed gas.
Class D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
Class E: Corrosive gas.
CEPA DSL: chlorine

SECTION 16 OTHER INFORMATION
OTHER PRECAUTIONS: Protect containers from physical damage. Do not deface cylinders or labels. Cylinders should be refilled by qualified producers of compressed gas. Shipment of a compressed gas cylinder which has not been filled by the owner or with his written consent is a violation of federal law (49 CFR).

Revise: 4
Date: August 20, 2009

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